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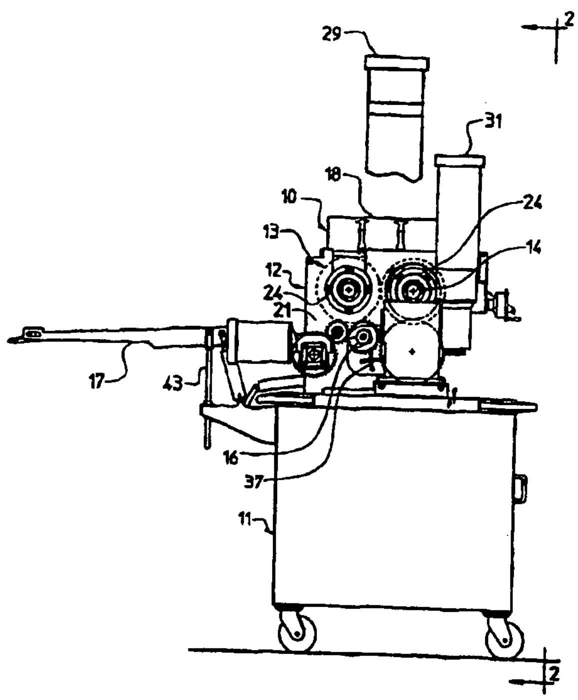
(54) Title: IMPROVED SHEETER MACHINE

(57) Abstract

A masa dough sheeter machine and process is disclosed for making tortillas and chips which eliminates the use of at least one stripper wire or doctor blade wherein the dough, including masa, is worked between pinch rolls wherein the gap may be varied in shape to achieve dough sheets of more uniform thickness laterally across the dough sheet.



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IMPROVED SHEETER MACHINE

REFERENCE TO PRIOR APPLICATION

This is a continuation-in-part of our application serial number 08/110,392 filed August 23, 1993.

FIELD OF THE INVENTION

The present invention relates to an improved sheeter machine for processing dough, including masa, into food products, such as tortillas and chips and particularly concerns a sheeter wherein the rolls are configured and operated so as to minimize in dough separation from the rolls the reliance on stripper wires and their associated mechanisms, the relative position of the rolls being variable to change the shape of the nip.

BACKGROUND OF THE INVENTION

The process for preparing dough into sheets such as for ethnic Mexican foods including tortillas, corn chips and the like requires a masa to be made from wet milled corn or corn flour, water and other additives. For certain other products, the dough may be made from rice, wheat flour and bean flour, etc. The dough or masa is processed into sheet form by being

compressed between pinch rolls and cutters are in some applications applied against the front roll (the roll nearest to the take out conveyor) to develop the selected shape for the product. After cutting, the product may be further formed and cooked such as by toasting, baking or frying, or in the case of tortillas, the product may be heat treated and packaged for later use.

The sheeting operation can be of critical importance in preparation of food products of this general type because of the natural variations of the physical properties of the dough or masa. It has been observed that the visco-elastic mass properties of the dough may vary as often as every 20 minutes which is a typical batch duration. The variations in coarseness or particle size of the corn flour, adhesive properties and moisture content in the masa influence the quality of the sheeted product. Many of the prior art sheeters were incapable of accommodating the wide variations in the visco-elastic mass properties of the masa dough and were unable to produce a product within specifications. The operators of such equipment would frequently completely discard entire batches of masa because the machines could not maintain product specifications. This was costly in lost production time and wasteful of raw materials.

Particularly in constructions where the sheeting rolls had stripper wires to separate the formed sheet below the nip, special attention was required for the proper position and tension of the stripper wire to assure adequate force between the stripper wire and the roll. Commonalty, the back roll was machined to a convex profile, an exacting and expensive operation, and the front roll was machined to a complimentary concave profile in order to ensure an accurate gap or nip between the rolls. In the case of the concave

roll, the position of the stripper wire is skewed at an awkward angle and the products stripped from the roll fall different vertical distances onto the conveyor there below and may be misaligned laterally on the conveyor. The October 30, 1990 U.S. patent to Joseph L. Mistretta, No. 4,966,541 addressed the difficulties of positioning the stripper wire against the convex face of the back roll and implied that the existence of the stripper wire was critical to effective and efficient sheeting of masa. The January 19, 1993, U.S. patent to Mistretta, No. 5,180, 593, shows driving the back and front rolls at the same surface speed and positions stripper wires on both the front and the rear rolls. The rear roll and cutter roll are driven from the front roll through a spur gear arrangement. There was apparently no perception in the prior art of selectively varying speeds over a wide range of either the cutter or the back roll to keep the products within specifications and to achieve efficient and effective sheeting without the use of a stripper wire or a doctor blade engaging the masa adjacent to the back roll. The elimination of the stripper wire or doctor blade and their attendant problems of adjustment and constant repositioning is an objective long sought.

In the processing of the products, such as masa, it is common to find that the material for dough varies in consistency from batch to batch. The machine operators will find the masa to differ in particle size, stickiness, cohesiveness, abrasiveness, flowability, and similar characteristics. This has been found to influence the shape, weight, thickness and quality of the final product. To accommodate some of these variables, it has been the practice of changing the speed of the machine pinch rolls such as by changing the gearing of the front and back rolls as well as the gearing of the cutter. The

limitations of available gear sets is a problem when the operator needs a speed change that lies within less than one gear tooth, that is to say, the calculated fraction of a gear tooth. One producer has changed the speed of the back roll to rotate slower than the front roll and has eliminated use of the stripper wire or doctor blade. Although changing gearing helps to accommodate variations in the product characteristics, it is recognized that it is costly not only from the standpoint of the mechanics' labor in effecting the change, but also in the down time of the production line in which the sheeter operates. Frequently the masa during down time will go "off" flavor and must be discarded.

As the material properties change, the size of the die cut product will change in the direction of travel at a varying rate as it is striped from the front roll and the size and weight of the finished product is directly affected by the varying masa properties and may drift outside of the allowed specifications. Thus, it is highly desirable to accommodate the variations in the masa while making the necessary changes to the sheeter without shutting down the entire processing line.

Uniformity in sheeted product thickness is highly desirable especially for tortilla chips, for example, where a high standard is generally specified. It has been found that not infrequently the product thickness varies considerably across the width of the sheeter rolls and this is attributed to non-uniformity in the nip through which the masa is extruded caused by deflection or deformation of the sheeter rolls due to the forces exerted in the sheeting operation. The dimensional change in the nip, and consequently the sheeted product, can be on the order of 0.001 to 0.020 inches and this is

an undesirable deviation from the product specifications. Thus we believe that better control over and better uniformity in the nip dimensional setting is needed to produce sheeted masa which is uniform in thickness all the way across the rolls. This control over the nip or gap dimension is needed no matter if the roll pairs are true right cylinders or a matched pair of concave convex rolls or a bastard pair of one true right cylinder roll and the other a convex roll. We propose to control better the nip dimension by skewing in the vertical plane the roll axis of one of the sheeter rolls as described herein below.

SUMMARY OF THE INVENTION

In summary, the present invention comprises an improved sheeter machine adapted to receive a supply of masa or the like to be sheeeted and includes a frame upon which are rotatably mounted front and back rolls, with the rolls being arranged so that their exterior surfaces are slightly spaced apart to define a nip disposed to receive masa dispensed from the supply. For fine control of the nip dimension and thereby more exact holding to product thickness specifications one of the rolls may be skewed to compensate for roll deflection. Means are provided for establishing a differential adhesion potential between the masa and the back roll from the masa and the front roll so that the masa, below the nip, departs from the surface of the back roll without the intervention of a stripper wire or doctor blade and it fully adheres to the surface of the front roll for cutting purposes. Stripping means are provided for separating the sheeted masa from the exterior surface of the front roll and a variable speed driven cutter acts with

the front roll permitting fine control of the cut shape of the sheeted product.

A general object of the present invention is to provide an improved sheeter machine which overcomes the limitations of the prior art which required the use of either a stripper wire or doctor blade for removing sheeted dough material from the back roll.

Another object of the invention is to provide in a machine of the type described means establishing a differential adhesion characteristic between the sheeted dough material and the back roll and the sheeted dough material and the front roll so that the sheeted material adheres to the front roll for cutting and separates from the back roll after the sheeting action through the nip.

Another object of the invention is to provide an improved sheeter machine which allows for an infinite range of differential surface speeds between the front and back rolls.

Another object of the invention is to provide in a sheeter machine a variable speed drive control for the back roll for enabling variations in the roll surface speed either faster or slower as needed to fulfill processing requirements or to provide a variable speed transmission acting on the front and back rolls to realize the speed differentials.

Another object of the invention is to provide a sheeter machine having an infinitely variable speed drive control coupled to the product cutters so as to better control the variations in the size, shape, flatness and weight of the cut product by varying the surface speed of the cutter as compared to the surface speed of the front roll.

Another object of the invention is to provide an improved sheeter

which has the capability of accommodating wide variations which could occur many times a day and in the different seasons of the year in the stickiness, abrasiveness, moisture content, and the like of the sheeted material by enabling changes to the relative surface speeds of the pinch rolls which changes may be made while the production line is in full operation so as not to require the suspension of production for making changes.

Another object of the invention is to provide means permitting one of the sheeter rolls to be skewed about an axis such that the nip dimension may be varied from the center of the roll pair to the edge of the rolls so as to compensate for roll deflection resulting from the forces generated in the sheeting operation.

Additional objects and features of the invention will be understood from a reading of the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side elevation of an improved sheeter machine made in accordance with the principles of the present invention;

Figure 2 is an end view taken in the direction of the arrows 2-2 in Figure 1;

Figure 3 is a plan view of the sheeter machine showing Figure 1;

Figure 4 is an enlarged sectional view taken in the direction of the arrows 4-4 in Figure 3;

Figures 5A and 5B are fragmentary, diagrammatic views of alternative embodiments of the rolls included in the present invention;

Figure 6 is a diagrammatic plan view of the rolls, greatly exaggerated, to illustrate roll deflection under load resulting in a non-uniform nip;

Figure 7 is a plan view like Figure 6 but illustrating roll deflection under load but with a uniform nip achieved with skewing the axis of the back roll in the vertical plane;

Figure 8 is a diagrammatic elevational view of the rolls, greatly exaggerated, illustrating the skewed back roll with respect to the horizontal centerline of the front roll;

Figure 9 is a diagrammatic plan view illustrating the nip point with the back roll skewed to show with some great exaggeration the change in the nip from the rolls central portion to the roll ends;

Figures 10A and 10B are sectional views taken in the direction of the arrows 10-10 in Figure 3;

Figure 11 is a view taken in the direction of the arrows 11-11 in Figure 10A; and

Figure 12 is a greatly enlarged detail view or the encircled structure in Figure 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figures 1-3, an improved sheeter machine 10 is shown and comprises a base frame 11, a corn head assembly 12, which includes front 13 and back 14 pinch rolls, a cutter assembly 16 and an off-loading conveyor assembly 17. A dough supply source such as a hopper 18 may contain a supply of dough, such as masa, is mounted with respect to the machine 10, above rolls 13 and 14, the lower portion of the hopper being

open to discharge a supply of masa into the nip defined between the rolls 13, 14.

The base frame 11 may be of conventional construction and may include a cabinet mounted on wheels to facilitate moving the unit into and out of a production line for producing products such as tortillas, tortilla chips, corn chips, and the like, where mixed dough is supplied to the hopper 18 and then formed by the sheeter machine 10 and sent forward in the production line to the off loading conveyor 17 to an oven or an oven and a deep fat fryer (not shown) for final cooking. Alternatively, formed products such as tortillas may be sent out with a simple heat treatment and packaged for later use. The base frame 11 is of sufficient strength to support the operating sheeter mechanism including the variable speed drive motors associated with their reduction gear boxes, etc.

The corn head assembly 12 include the upstanding side frame plates 21 (shown in Figures 2 and 3) which serve as a mounting support for the rolls 13, 14 and their associated support bearings and other drive components. More particularly, each of the rolls 13, 14 includes a shaft 22, 23 respectively (Figure 4), the ends of which are carried by the bearing assemblies 24.

As indicated by the arrows 26 in Figure 4, the rolls 13 and 14 are driven in a counter-rotation relationship so as to define an axially extending nip 27 which serves to compress and work the dough 28 into the desired thickness as established by the spacing which may be varied between the exterior surfaces of the rolls 13 and 14 at the nip 27. Unlike the prior art, there is no doctor blade or stripper wire positioned at just below the nip 27

for removing masa from the back roll 14. A stripper wire assembly (not shown) of conventional construction may be employed in cooperation with the front roll 13 for removing product most efficiently from the roll after the operation of the cutter assembly 16.

Greatly assisting the separation of the compressed dough from the exterior cylindrical surface of the back roll 14 is the speed of driving the back roll relative to the speed of driving the front roll 13. One manner of creating a differential adhesion potential between the masa and the two rolls 13, 14 is to drive the back roll 14 at a surface speed slower or faster than the surface speed of the front roll 13. This contrasts with the prior art in which the surface speeds generally were the same on both sheeter pinch rolls. The front and back rolls are driven independently, the front roll by a variable speed drive assembly 29 and the back roll by variable speed drive assembly 31. Each drive assembly 29, 31 includes a speed reduction gear drive and a brake. Suitable driving couplings are provided between the motor drive assembly 29 and the shaft 22 of the front roll as well as between the variable speed motor drive assembly 31 and the shaft 23 of the back roll. A suitable drive assembly 29 for the front roll has been found to be a Sterling Electric single reduction speed reducer, Sterling No. 700BC-50-213TC-2 from Sterling Electric Company in Irvine, CA; Balder Electric Motor, 7 1/2 Hp, No. VBM3710T, Ft. Smith, AK; Allen-Bradley Variable Frequency AC Motor Drive, No. 1336-B007, Milwaukee, WI.

A suitable variable speed drive for the back roll was found to be Peerless-Winsmith, Inc., Springville, NY, Winsmith Double Reduction Speed Reducer, No. 7MCTD; Seco Electronics, Lancaster, SC, Seco DC Motor, 3

Hp, No. MOK7210800; Seco Variable Speed DC Motor Control, No. SE2005.

In operation, varying the speed of the back roll a range may be selected from 5 to 60 RPM. The front roll may be driven with suitable gearing at from 25 to 60 RPM. Highly effective sheeting of a high moisture masa (50% moisture) was achieved when driving the back roll at 66% of the speed of the front roll where previously it had been very difficult to sheet such very sticky masa using a doctor blade on the back roll which is one example. Certain products can be better handled with the back roll driven at a faster surface speed than the front roll.

The rolls 13 and 14 may be constructed to the same outside diameter and surface texture although this is not critical to this embodiment for achieving a differential in adhesion properties between the two rolls with respect to the material being sheeted.

Referring now to Figure 5A, the rolls 13' and 14'shown there for another embodiment of the invention are made so that one of the rolls, for example the back roll 14', has a finish with a different "tooth" or attractiveness to the masa product, for example, a lesser "tooth" or attractiveness than that of the front roll. This effect in differential roughness can be realized by machining the smoother surface, grinding or polishing, plating or coating, etc. on the roll 14'and the other roll 13'can be furnished with a normal sandblasted finish. The rolls 13' and 14' can each be constructed from a different material or a metal plating or a plastic material can be applied to the surfaces of the rolls.

Referring now to yet another embodiment as shown in Figure 5B, in

order to achieve the differential in adhesion, a back roll 14''can be made in a smaller diameter than the front roll 13''.

The rolls of these embodiments may be constructed as true right cylinders or the front roll may be crowned or ground to a convex profile, for example .060 inches diameter enlargement in the central portion of a 30 inch long roll, which greatly assists in maintaining effective stripping forces between the stripper wire and roll. A convex roll needs less skew in the stripper wire than does either a concave or true right cylinder roll. With less skew, the trajectory of the cut product onto the take out conveyor is greatly improved and results in fewer product defects. This serve to establish a substantially common product transfer point from one side of the roll to the other.

The back roll can be shaped complimentary to the front roll and thus would be concave in profile, for example a .060 inches diameter reduction in the central portion of a 30 inch long roll, where the front roll is convex. In the prior art, the back roll was customarily convex in profile so as to accommodate the tension in the stripper wire employed and then necessarily and the front roll was concave in profile. In the embodiments of this invention and as reflected in Figures 5A and 5B, the back roll can be formed to a true right cylinder whether or not the front roll is of convex profile or a true right cylindrical profile. This enables a good range of control over the dimensions of the nip or gap between the sheeter rolls to accommodate for roll deflection during sheeting operations. A convex roll for the purposes of this invention includes a roll tapered uniformly from a central roll portion having a larger diameter to the roll ends having a somewhat lesser diameter,

say a difference of .060 inches in a 30 inch long roll.

The cutter assembly 16 is shown in Figures 2 and 4 and comprises a cutter roll 36 and cleaner brush assembly 37. The shaft of the cutter roll 36 is mounted on the cam plate 38 which operates as a bell crank driven from the cylinder 39, (Figure 4). The cutter roll 36 is driven in the direction of the arrow 41 as shown in Figure 4 by a variable speed motor drive 42, Figure 3. Although the cutter may be operated at the same peripheral or surface speed as the front roll 13 moves, it has been found that by varying the speed of the cutter by small numbers of RPM's and fractions of RPM's, the shape of the product may be changed in desirable ways. For example, where the product due to the consistency of the masa, has been cut and found to be somewhat in an elongated or oval shape, the speed of the cutter roll may be reduced* to bring the product shape, as cut, to virtually a perfect circular shape. And, conversely, as the shape of the product coming from the cutter to the take-out conveyor is a shape which is a squat oval shape, the speed of the cutter may be increased* by use of the variable speed drive 42. This enables the operator to establish the desired more perfect circular shape. Likewise, where triangular shaped, strip shaped or polygonal shaped products are being cut, the shape of the elongation or contraction of the products may be controlled and the same is true where the product is free form or of another shape. It will be understood that all of the above changes may be achieved without shutting down the production line such is required when different gears set are needed to be substituted to obtain the desired speed ratios. A suitable variable speed drive for the cutter roll is: Peerless-Winsmith, Inc., Springville, NY, Winsmith Single Reduction Speed Reducer

No. 917MDT, 50:1; Seco Electronics, Lancaster, SC, Seco 1 Hp DC Motor No. MOH6211100 and Seco DC Motor Control No. 160.

The off loading conveyor assembly 17 may be of conventional construction and operated at the same linear speed as required in the production line in which the unit 10 is installed. A height adjustment mechanism 43 is included with the conveyor assembly 17 for properly aligning the unit with an associated production conveyor (not shown).

The improved sheeter disclosed incorporates infinitely variable speed drives on the cutter, for the front roll and for the back roll. The variable speed drives can be coupled in circuit with a master speed controller (not shown) so that when necessary to speed up or slow down the production line and thus the sheeter, the selected speed relationships between the cutter and roll drives can be changed accordingly while maintaining the desired inter relationships of the drive speeds.

We have observed a variation in the sheeted product thickness and weight which is due to the deflection of the sheeter rolls from the forces occurring in sheeter operation. In the case of a corn product such as tortilla chips, there sometimes appear dimensional variations in the thickness of the chips after sheeting and cutting in the range of 0.001-0.020 inches. Chips from the end portions of the sheeter rolls were found sometimes thinner than those chips cut from masa sheeted in the central portion of the rolls. This non uniformity in chip thickness and weight is an undesirable deviation from the product specifications and, with the apparatus arranged as disclosed below, we improve greatly on maintaining closer tolerance in the sheeted products all across the rolls, although roll deformation is not eliminated.

Referring specifically to Figure 6, the problem is diagrammatically illustrated there in exaggerated form as it is perceived. Here, the nip between the rolls at the roll end is shown as measured and established in the stationary condition. The flex or deformation bow shown along the length of the rolls is due to the forces generated in the sheeting operation. Although greatly exaggerated in the Figure 6, we show that the nip increases in size from the roll end portions towards the central portion of the roll and then decreases towards the other end portions of the front and back rolls.

Referring to Figure 7, an ideal condition in the roll set is to maintain the nip constant in dimension over the full length of the rolls even though the rolls are undergoing distortion and deflection during the sheeting operation. The nip ideally should be constant from the one side of the rolls set to the other to ensure that the product sheeted has a uniform thickness and weight after cutting within a close tolerance. It is recognized that others have reacted to roll deformations in an all together different manner such as by re-enforcing the rolls themselves or by applying one or more backup rolls so as to combine the strength of the backup rolls with that of the active or working roll and thus to significantly reduce roll deformation. Such elaborate steps have been found successful in metal working fields but such complexity is undesirable in working with food materials, especially in view of the sanitation requirements and the need to clean up the machines frequently. Our solution, however, is greatly simplified and diagrammatically illustrated in Figures 8 and 9 and described below.

More specifically, Figure 8 illustrates, in an exaggerated form, the shift or skewing of the center line of the back roll in a vertical plane while

maintaining the front roll with its center line on substantially true normal horizontal. The skewing of the back roll with respect to the front roll changes the opening of the nip as viewed from the developed view illustrated in Figure 9. One arrangement for achieving a compensating adjustment to the sheeter nip is shown in Figures 10 through 12 where means are disclosed for skewing the back roll by raising one end of the roll while lowering the opposite roll end. This shifts the axis of the roll in the vertical plane.

Referring to Figures 10-12, it will be understood that in the embodiments of the invention as disclosed first above, the upstanding side frame plates 21 serve to support the bearing assemblies 24 of both the front and back rolls 13, 14. In this embodiment of the invention, however, the bearing assemblies 24 which rotatably support the shafts 23 of the back roll 14 are each mounted on a movable side plate sub-frame bearing mount 51. Each sub-frame 51 is equipped along one lower margin with a spaced pair of roller wheels 52 rotatably mounted to the plate bearing mount 51 so that the roller wheels extend below the lower margin to be supported by and roll upon a level adjustment block 53. It will be understood that each roll shaft 23 of the back roll 14 is equipped with the members of 51-53 as described above. The level adjustment block 53 is mounted to the upstanding side frame plate 21 for ready adjustment by the cap screw fasteners 54 which extend into oblong or elongated slots 56 formed in the adjustment block 53. It will be seen that the long axis of the adjustment slot 56 is arranged at an acute angle from the vertical on the order of 60 degrees. The block securing fasteners 54 may be loosened when it is desired to shift the level adjustment

block either to the left or to the right as viewed in Figure 10A, and then re-tightened to maintain the block 53 in the selected position to place the roll centerline in a desired position for changing the nip. On each side of the sheeter, a level adjustment jack screw assembly 57 is rigidly mounted on the side frame plate 21. The jack screw engages one end of the adjustment block 53 and when rotated urges the block 53 to rise or drop for raising or lowering the bearing mount plate 51 and the associated shaft of the back roll. The jack screw is provided with a suitable locking mechanism so as to assist the assembly 57 to retain the select position after shifting the level adjustment block 53 as required. It will be understood that as the jack screw is rotated to move forwardly to the left as seen in Figures 10A and 10B the level adjustment block 53 is advanced and the block 53 is permitted to move lower urged by gravity and the weight of the supported roll, the fasteners 54 ride in the elongated slots of 56 to take the position as illustrated in Figure 10B. In that condition, the associated end of the back roll 14 has been lowered the distance indicated at number 58, Figure 10B, below the generally horizontal center line of the front roll. A converse or opposite adjustment can be made on the opposite side of the roll 10B such as by retracting the jack screw 57 to cause the level adjustment block to raise a selected distance, thus to raise that end of the back roll 14. This establishes the skewed relationship between the front roll 13 and back roll 14, the skewing occurring in the vertical plane extending through the axis of the back roll. The center line of the back roll in the fully adjusted up position is indicated at 59 and here the fasteners 54 are disposed at the bottom of the oblong slot 56. The fasteners 54 are fully tightened to lock down the

level adjustment block 53 and the jack screw assembly is secured to prevent motion of the parts during sheeter operation. A pair of vertically oriented lock down machine screws 55, Figs. 10A and 10B, engage the bearing supports and resist the forces tending to move the back roll vertically upwardly during sheeting operations. This overall effective arrangement of the bearings carried on movable side plates equipped with xrollers is effected to establish easily a skew of the back roll for controlling the dimension of the nip for accommodating deflection in the rolls from the sheeting forces.

As an example of the utility of the skewed axis approach, it was found that in a sheeter operating to form tortilla chips from corn masa that the target weight for the chips was 2.8 grams per chip. This was a relatively thick product. The chips sheeted and cut from the outside edges of the sheeter roll set were somewhat thinner and were under the target weight by as much as 0.60 grams. To correct to a significant degree this underweight in the product the back roll was skewed. The roll, which was 37.5 inches wide, was raised on one side by 3/16 inches and lowered on the opposite side by 3/16 inches. After this change in the sheeter rolls relative relationship, it was found that the deviation in the sheeted product was reduced from 0.60 gram per chip to 0.30 grams per chip. This was an important corrective change to the weight of the corn chip product.

While the improved sheeter machine has been described in connection with the preferred embodiment, it is not intended to limit the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalence as may be included within the sphere and scope of the invention as defined by the appended claims.

WE CLAIM:

1. An improved sheeter machine serving to receive a masa dough or the like from a supply thereof comprising:

a frame,

first and second sheeter rolls on said frame, wherein said first and second rolls have first and second substantially cylindrical exterior surfaces and first and second shafts, respectively, and said first and second shafts being rotatably mounted on said frame in a substantially parallel relationship;

said rolls being arranged so that their exterior surfaces are spaced slightly apart so as to define a nip disposed to receive masa dispensed from the supply thereof;

means serving to establish and control, over a variable range, a differential adhesion characteristic between the masa material to be sheeted and the exterior surfaces of each of said sheeter rolls so that the sheeted material below the nip separates from the first roll while adhering to the second roll; and

means for separating finished, sheeted masa from the exterior surface of the second moving roll.

2. The sheeter machine of claim 1 wherein said exterior surface of one of said rolls has substantially greater dough attracting "tooth" than the surface of the other roll.

3. The sheeter machine of claim 1 and including drive means serving to drive said sheeter rolls shafts so that the rolls rotate at differential exterior surface speeds such that the speed of said first roll is slower than the surface speed of the second roll;

said drive means including an infinitely variable speed drive control means serving to permit selective change in the surface speeds of one of said rolls.

4. The sheeter machine of claim 1 wherein one of said rolls is made to a smaller diameter than the other roll.

5. The sheeter machine of claim 1 and including cutter means cooperating with said first moving roll serving to provide shaped products from the sheeted masa,

and means for driving said cutter means at surface speeds independent of the surface speed of said faster moving roll.

6. The sheeter machine of claim 1 wherein the masa departs from the exterior surface of said first roll without the intervention from other physical elements including a stripper wire and a doctor blade.

7. The sheeter machine of claim 1 wherein the first roll is convex in profile and the second roll is complimentary in profile to the first roll.

8. The process of sheeting masa or other food product dough from a supply thereof, including the steps, providing first and second pinch rolls arranged to define a substantially horizontally extending nip between the rolls,

receiving the masa in the nip from the supply to pass therethrough thereby consolidating the masa into a sheet while counter-rotating the rolls,

causing the masa below the nip to separate from one of said rolls without intervention of a stripper wire or a doctor blade by causing said roll to rotate at a slower surface speed than the surface speed of the other roll thereby creating differential surface speeds between the first and second pinch rolls, and stripping the sheeted masa in selected shapes from said other roll.

9. The process of claim 8 and including the step of providing rotatable cutter means co-operatively engaging the masa on said other roll serving to define selected product shapes, and controlling the product shape by rotating the cutter means at selectively variable surface speeds with respect to the speed of said other roll.

10. The process of claim 8 wherein the masa separates from said one roll due to the differential in adhesion between the masa and the first and second rolls being caused by the selected surface rotational speed of said rolls.

11. The process of sheeting masa or other food product dough from a supply thereof, including the steps,

providing front and back pinch rolls arranged to define a substantially horizontally extending nip between the rolls,

receiving the masa from the supply into the nip to pass therethrough thereby consolidating the masa into a sheet while counter-rotating the rolls,

providing means serving to establish a differential adhesion potential between the masa and the back roll from the masa and the front roll so that the masa, below the nip, departs from the surface of the back roll without the intervention of a stripper wire or doctor blade and it fully adheres to the surface of the front roll for cutting purposes,

cutting the sheeted masa into selected shapes while the masa adheres to the front roll and stripping the selected cut shapes from the front roll.

12. The process of claim 11 and including the step of controlling the cut size of the selected shapes by varying the relative speed between the front roll and the cutting means.

13. An improved sheeter machine serving to receive a masa dough or the like from a supply thereof comprising:

a frame,

front and back sheeter rolls on said frame, wherein said rolls have substantially cylindrical exterior surfaces and first and second shafts, respectively,

said first and second shafts being rotatably mounted on said frame in a substantially parallel relationship;

said rolls being arranged so that their exterior surfaces are spaced

slightly apart so as to define a nip disposed to receive masa dispensed from the supply thereof;

first and second variable speed drive means coupled to said first and second shafts serving to rotate said front and back rolls respectively to establish and control, over a variable range, a differential adhesion characteristic between the masa material to be sheeted and the exterior surfaces of each of said sheeter rolls so that the sheeted material below the nip separates form the back roll while adhering to the front roll;

rotatable cutter means serving to engage masa on said front roll for cutting masa into predetermined shapes;

third variable speed drive means serving to rotatably drive said cutter means at selected surface speeds the same as and slower and faster than the rotational surface speed of said front roll for adjusting the finished dimensions of the cut masa pieces; and

means for separating the cut pieces of sheeted masa from the exterior surface of the front roll.

14. The sheeter machine of claim 13 wherein said exterior surface of said front roll has substantially greater dough attracting "tooth" than the surface of the back roll.

15. The sheeter machine of claim 13 wherein said first and second drive means serve to drive said sheeter rolls shafts so that the rolls rotate at different exterior surface speeds such that the speed of said front roll is slower than the surface speed of the back roll.

16. The sheeter machine of claim 13 wherein one of said rolls is made to a smaller diameter than the other roll.

17. The sheeter machine of claim 13 wherein the masa departs from the exterior surface of said back roll without the intervention from other physical elements including a stripper wire and a doctor blade.

18. The sheeter machine of claim 13 wherein the front roll is convex in profile and the back roll is concave and complimentary in profile to the first roll.

19. An improved sheeter machine serving to receive a masa dough or the like

from a supply thereof comprising:

a frame,

front and back sheeter rolls on said frame so arranged that their cylindrical exterior surfaces are spaced slightly apart so as to define a nip disposed to receive masa dispensed from the supply thereof;

drive means coupled to said sheeter rolls serving to urge the masa through the nip;

means serving to urge the masa to disengage from the back roll below the nip and to adhere to the front roll as the masa is sheeted;

rotatable cutter means serving to engage the sheeted masa on said front roll for cutting into predetermined shapes;

variable speed drive means coupled to said cutter means serving to

rotate said cutter at selected surface speeds the same as and slower and faster than the rotational surface speeds of the front roll for adjusting selectively the finished length dimensions of the cut masa pieces; and

means for separating the cut pieces of sheeted masa from the cylindrical surface of the front roll.

20. An improved sheeter machine serving to receive a masa dough or the like from a supply thereof comprising;

a frame;

front and back sheeter rolls on said frame so arranged that their cylindrical exterior surfaces are spaced slightly apart so as to define a nip disposed to receive masa dispensed from the supply thereof;

drive means coupled to said sheeter rolls serving to urge the masa through the nip;

means serving to urge the masa to disengage from the back roll below the nip and to adhere to the front roll as the masa is sheeted;

rotatable cutter means serving to engage the sheeted masa for cutting the masa into predetermined shapes;

first and second bearing assembly means serving to mount said front and back rolls respectively with respect to said frame,

said bearing assembly means including means for skewing the axis of one of said rolls in a vertical plane and serving to maintain the axis of the other of said rolls substantially horizontal serving to vary the nip opening in the horizontal plane for sheeting product more uniformly in thickness and weight across the width of the sheeter rolls.

21. The sheeter machine of claim 20 wherein said bearing assembly means serves to skew the axis of said back roll.

22. The sheeter machine of claim 20 wherein said second bearing assembly means for mounting the back roll with respect to the frame includes moveable adjustment means serving to support each end of the back roll, and means for shifting the adjustment means so as to raise and to lower the ends of the back roll in a vertical plane, and means serving to fixedly secure and hold the adjustment in a selected position for maintaining the nip opening in the adjusted condition.

23. The sheeter machine of claim 20 wherein said second bearing assembly means for mounting the back roll with respect to the frame includes moveable side plate means serving to support each end of the back roll, level adjustment block means engaging said side plate means and mounted to said sheeter frame, incremental adjustment means serving to urge said level adjustment block means and said moveable side plate means for raising and lowering the ends of the back roll in a vertical plane for effecting the skewing of the back roll with respect to the front roll.

24. The sheeter machine of claim 23 wherein jack screw means serve as said incremental adjustment means and locking means engaging said moveable side plates serving to maintain said moveable side plate means in a selected vertical position for establishing the desired nip configuration for sheeting operations.

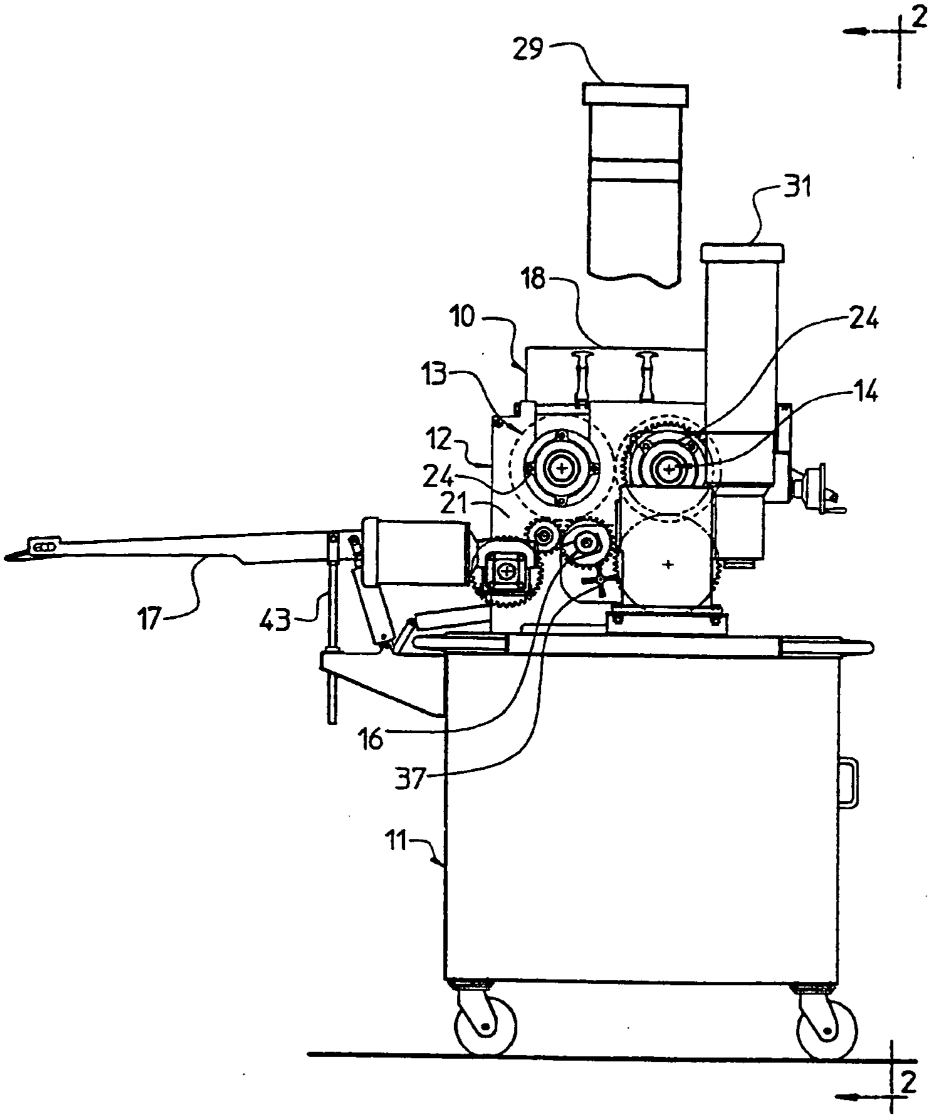


FIGURE 1

SUBSTITUTE SHEET (RULE 26)

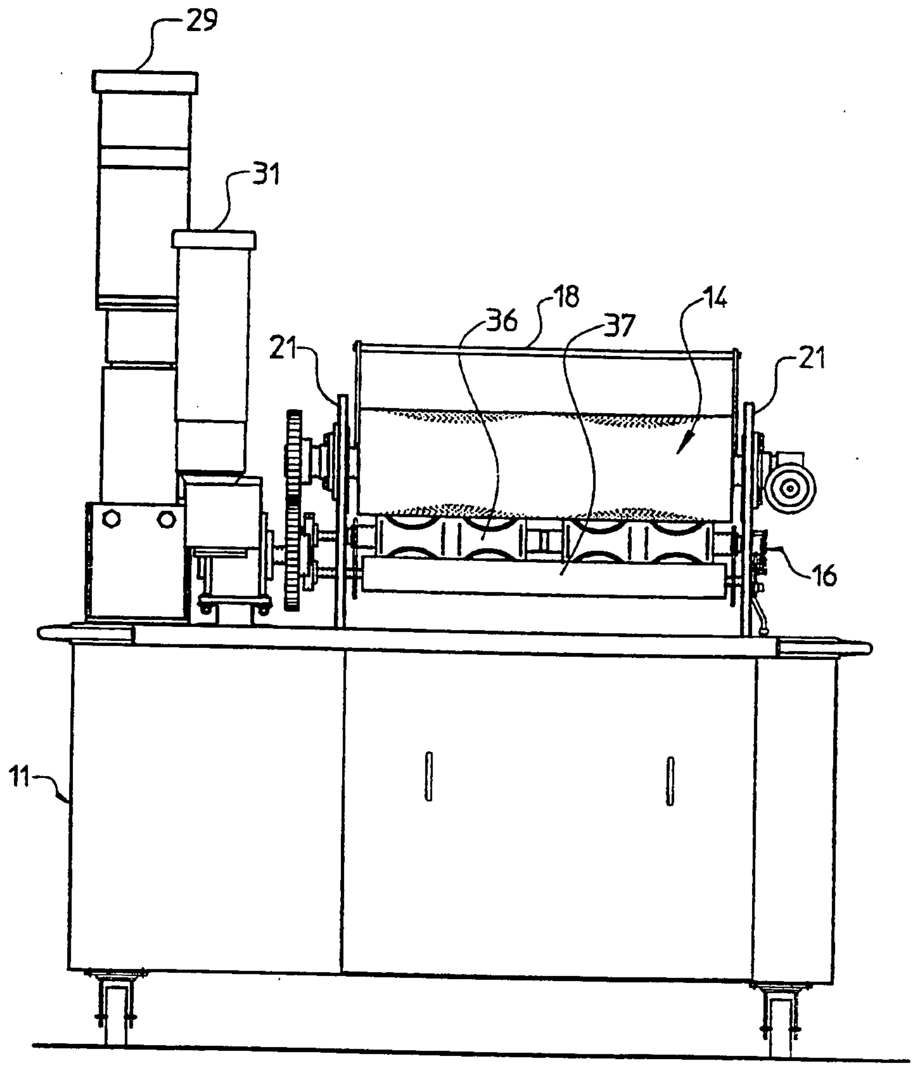


FIGURE 2

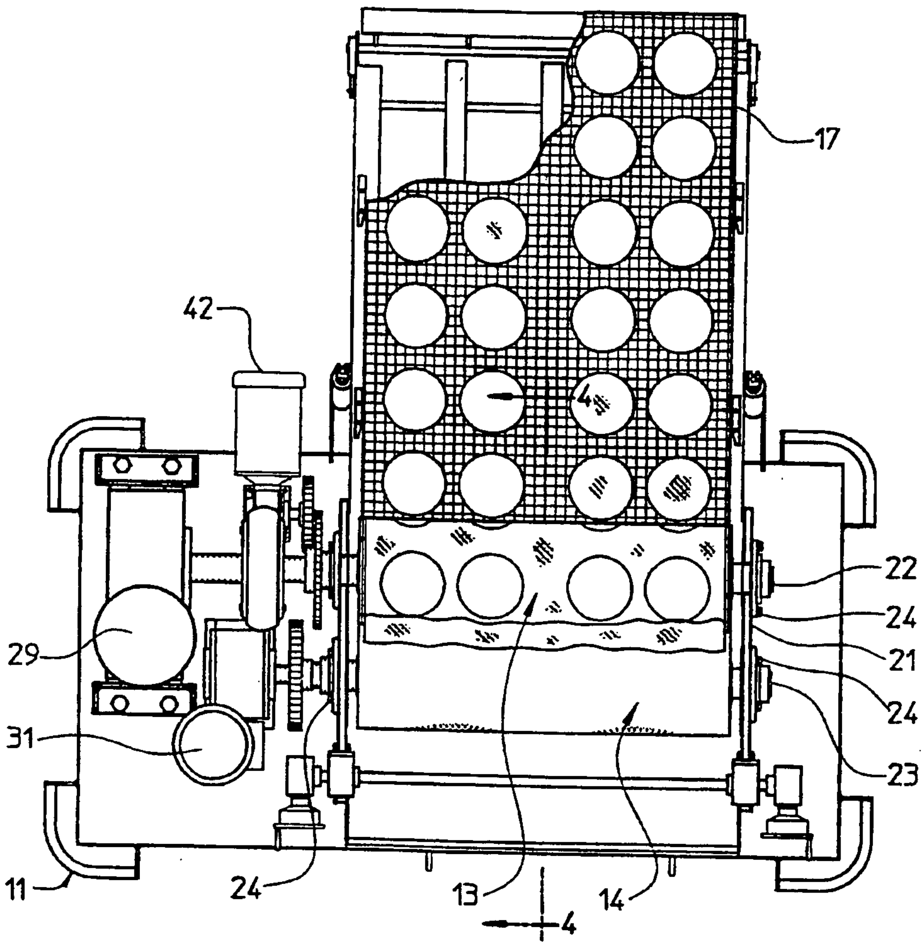


FIGURE 3

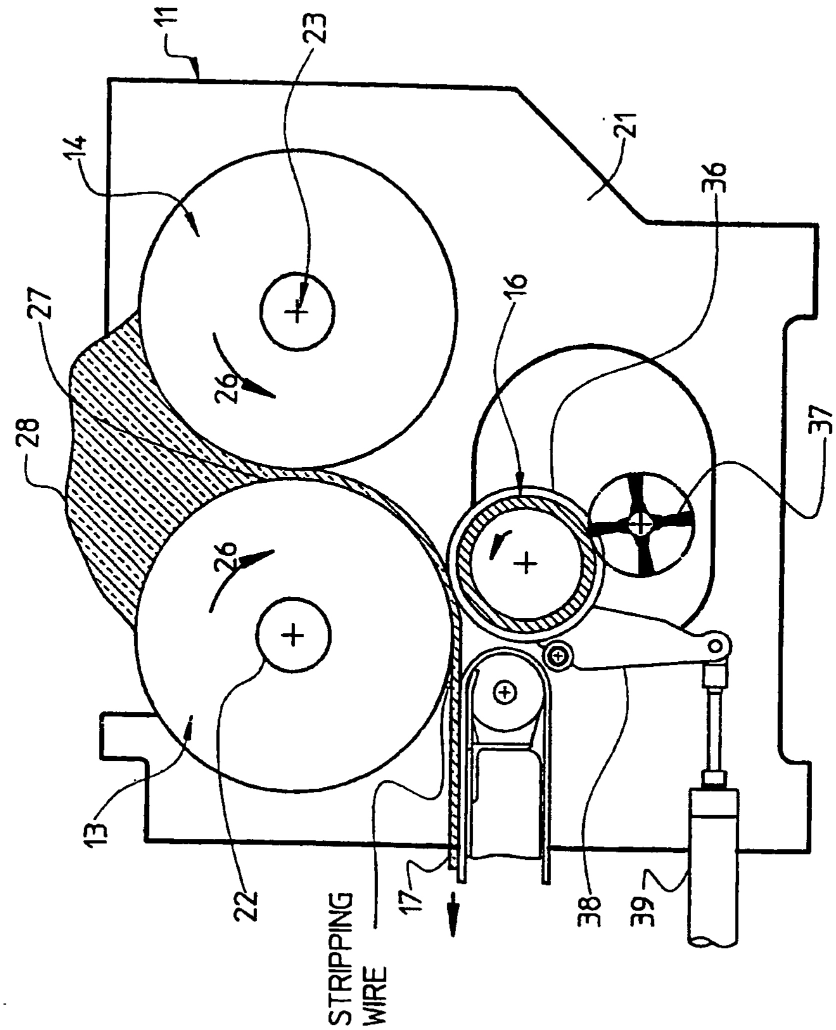


FIGURE 4

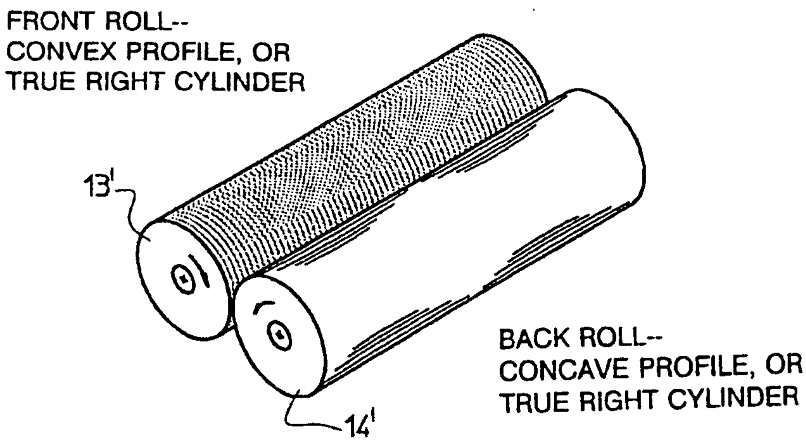


FIGURE 5A

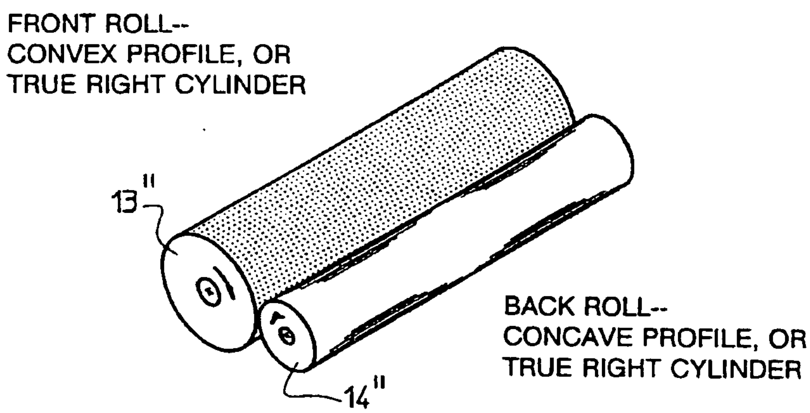
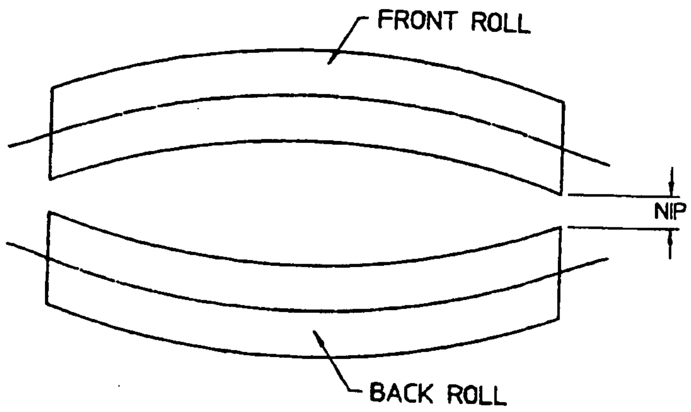


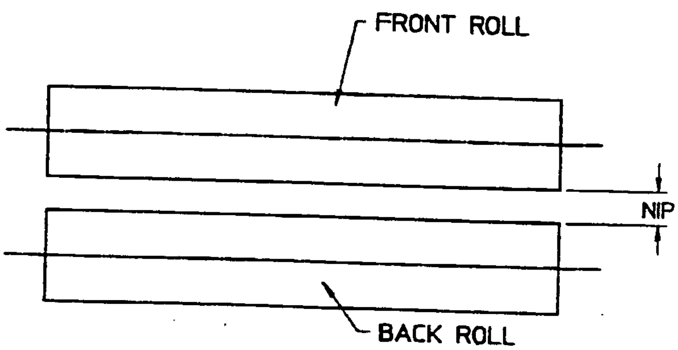
FIGURE 5B

SUBSTITUTE SHEET (RULE 26)



PROBLEM IN PRIOR ART

FIGURE 6



IDEAL CONDITION

FIGURE 7

SUBSTITUTE SHEET (RULE 26)

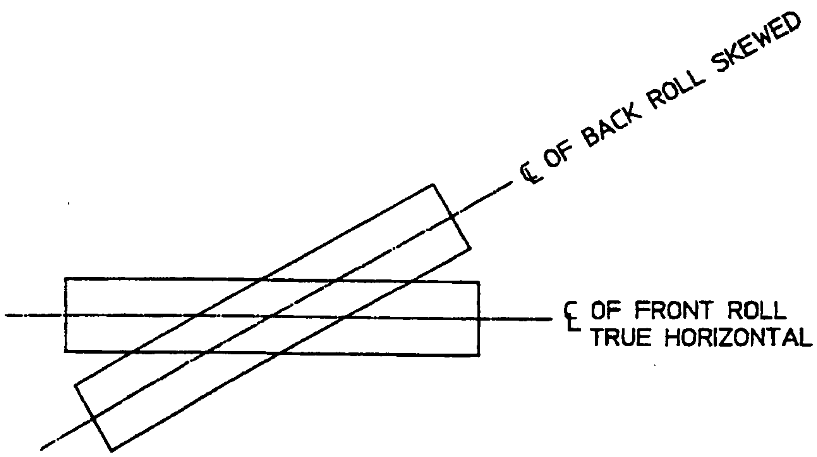


FIGURE 8

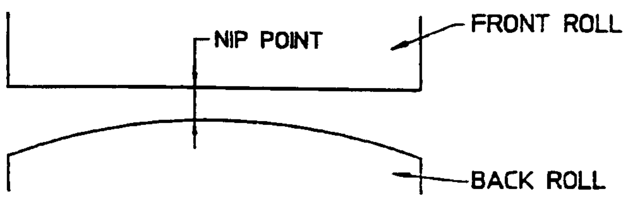


DIAGRAM OF THE "NIP" POINT WITH BACK ROLL SKEWED

SHOWING CHANGE IN NIP FROM CENTER OF ROLL TO EDGE OF TO ROLL TO COMPENSATE FOR ROLL DEFLECTION

FIGURE 9

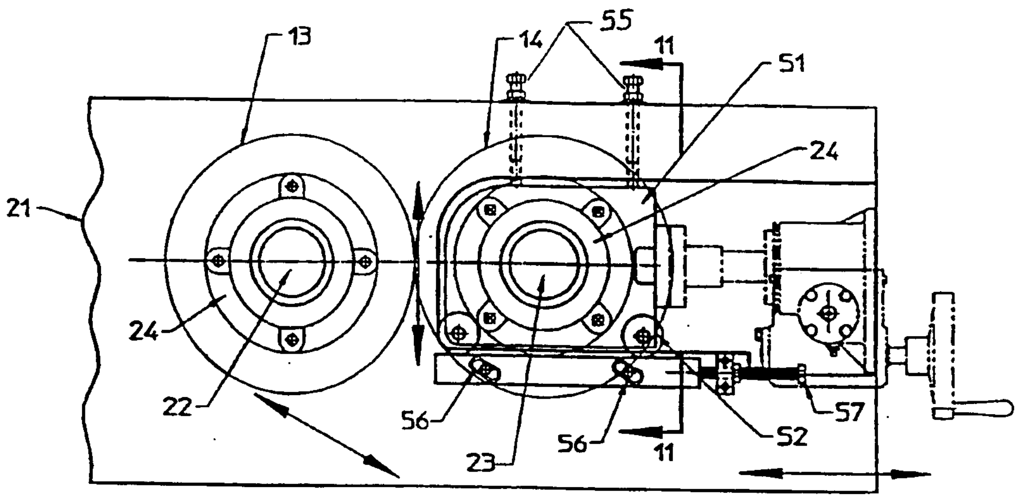


FIGURE 10A

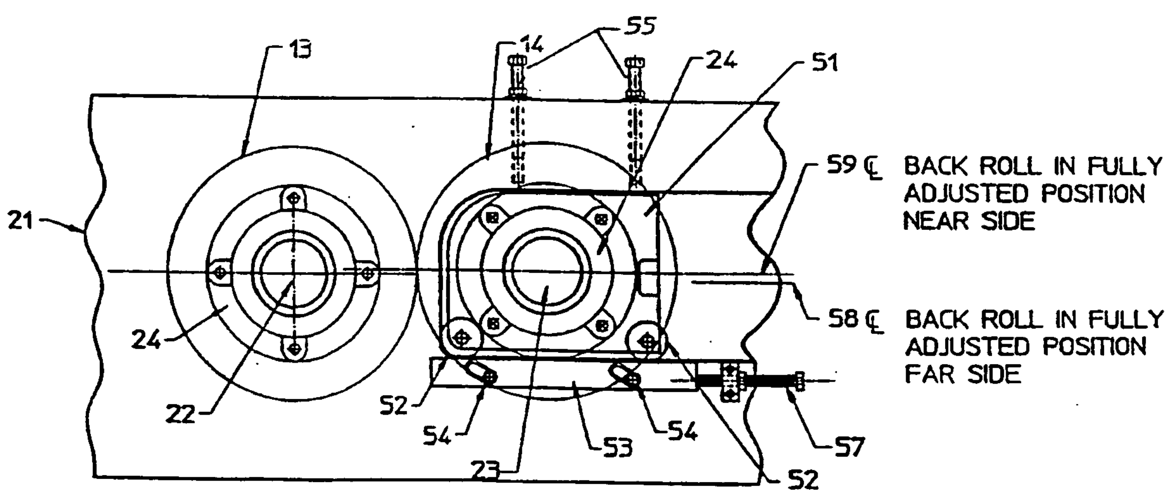


FIGURE 10B

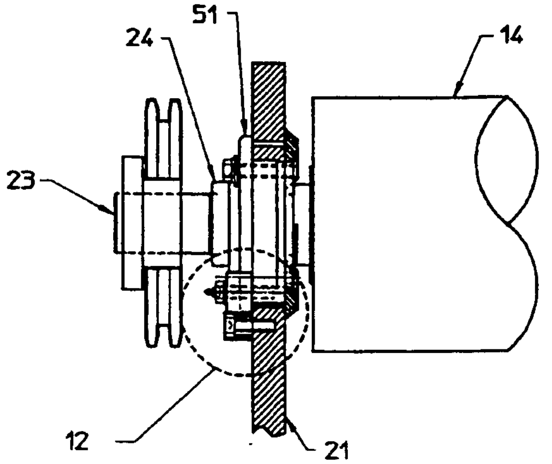


FIGURE 11

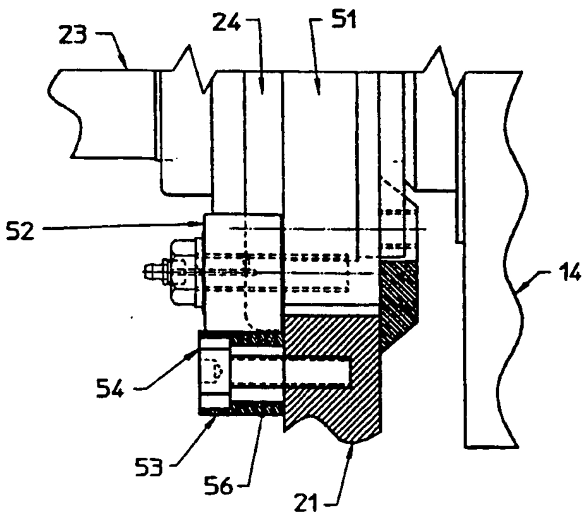


FIGURE 12